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SnapLogic® Special Edition

Enterprise Automation

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What is enterprise automation?

How to integrate and transform organizations

Proven tips to automate business processes

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Michael Nixon

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by Michael Nixon

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Introduction

The world and how we perform our jobs are changing rapidly. There are new opportunities for doing business over digital channels and evolving business models enabled by emerging digital technologies. Industry experts predict that by 2024, 69 percent of a manager's workload will be replaced with artificial intelligence and automation (Gartner, Predicts 2020: AI and the Future of Work report, January 2020; https://www.gartner.com/en/newsroom/press-releases/2020-01-23-gartner-predicts-69--of-routine-work-currently-done-b).

Add to this a new future evolving from unforeseen operational necessities propelled by the global pandemic and its aftermath. Being swift and nimble is even more critical. The fate of an organization depends on it. Companies must adapt to new realities or risk falling behind the competition — or worse, being unable to shift to survive in the new digital world.

Getting to this, itself, however, is a challenge. Cloud SaaS applications (tons of them), on-premises systems of record, data platforms and analytics warehouses all have varying degrees of integration capabilities, leaving you with collaboration-breaking silos, slower than desired business processes, and less than desired business outcomes.

Gartner forecasts that the market for hyperautomation enabling technology will reach nearly $600B by 2022, up 24 percent from 2020 levels. Gartner states it expects companies that "combine hyperautomation technology with redesigned operational processes" will save 30 percent on operational costs by 2024 (Gartner, April 2021, https://www.gartner.com/en/newsroom/press-releases/2021-04-28-gartner-forecasts-worldwide-hyperautomation-enabling-software-market-to-reach-nearly-600-billion-by-2022).

Indeed. New technology and integration approaches have evolved to meet the challenge of automating data flows (operational and analytical) across the enterprise and its people to attain the collaboration, digital transformation, and amazing business results they seek.

About This Book

Many technologies claim, but don't truly deliver, business process automation across an entire enterprise and its people in an uncomplicated manner.

Welcome to *Enterprise Automation For Dummies*, your guide to understanding how modern enterprise automation enables companies to empower people at unheard of scale to create their own app and data integrations. Especially in this post-pandemic age and beyond, where self-sufficiency is the new expectation, companies armed with modern enterprise automation simplify complex business processes, accelerate exceptional business results from data, and transform organizations to execute at a higher level.

Foolish Assumptions

In writing this book, I made some assumptions about who will be reading it. I assume that you fit one of these general profiles:

- You're an interested reader, not technical, possibly on the business side of an organization, and you want an easy-to-understand guide that will further your knowledge about enterprise automation and integration concepts.
- You're an enterprise architect interested in exploring enterprise automation from a modern, cloud-first perspective to determine viability for your company's digital transformation and enterprise-wide data strategies.
- You're an IT or integration executive or specialist, or a data engineer interested in a quick overview of enterprise automation. You want to calibrate your thinking regarding app and data integration solutions that could help your organization to automate business processes and accelerate business results.

Icons Used in This Book

Throughout this book, I occasionally use icons to call attention to important information. Here's what you can expect.

REMEMBER

This icon points out the key takeaways that you'll want to file away in your mind for later recall.

TECHNICAL STUFF

Anything marked with this icon is fairly technical, like a list of standards or an explanation of the inner workings of something.

WARNING

When you see this icon, look for friendly advice for sidestepping pitfalls.

TIP

This icon points out bright ideas and best practices that can help your organization make the most of enterprise automation.

EXAMPLE

The case studies provide examples (including a sample of key application and data endpoints) and outcomes from organizations that have successfully used modern enterprise automation methods.

Beyond the Book

This book is intended to be both informative and a reference guide. Although it's full of good information, I could only cover so much in 64 pages! So, if you find yourself wanting more, just go to `snaplogic.com`, where you can get to additional information about enterprise automation and how SnapLogic is leading the way to make it happen. You can even try our solution for free! We'd love to hear from you.

IN THIS CHAPTER

- Learning why enterprise automation is so desirable
- Building your enterprise automation vocabulary

Chapter 1
Embracing the New Normal

The global pandemic health crisis has been a gut punch to many companies in all parts of the world.

Now is a period where companies everywhere think differently. Mike Tyson, former heavyweight champion of the world, was quoted before his infamous fight with Evander Holyfield, "Everyone has a plan until punched in the mouth," in reference to how Tyson was going to derail Holyfield's fight plan against him. Holyfield and his plan withstood Tyson's bruising and won.

Since 2020, due to the pandemic, businesses everywhere have been punched hard and are in a fight for survival. Confronted with sudden and unexpected changes to business plans, those with cloud-focused, digital business models are faring better than those without. Yet even organizations that have pursued digital transformation are fighting new challenges and workforce changes that require changes in thinking.

If you've read this far, count yourself among the many people and leaders who now acknowledge the negative impact from old approaches to integrate data and applications (even cloud applications). For enterprise environments in particular, negative impacts from poor enterprise-wide integration, such as lack of agility, slow business processes, and inability to self-serve, were magnified and laid bare by the pandemic.

Why Enterprise Automation?

WARNING

Just as companies come in all shapes and sizes, integration occurs in many shapes and sizes. However, in whatever form, without proper integration, data flows slow down or halt, especially without properly combined data and application integration. This leads to business processes that slow down or that fail to execute. As a result, workers are less effective and efficient at their jobs. Executives make slower decisions, costs increase, and business opportunities and revenue are lost. In the end, without proper application and data integration, businesses suffer.

So what's the solution? Enterprise automation. Going beyond single, point-to-point integrations, *enterprise automation* refers to an organization's ability to automate and flow operational and post-operational data (for example, analytics data) between multiple applications and systems to automate complete business processes. This reduces the amount of human labor and time involved in making things happen, which accelerates business results. Enterprise automation is also about empowering large numbers of professionals, whether in IT or on business teams, to perform their own integrations. There are other benefits as well. See Figure 1-1.

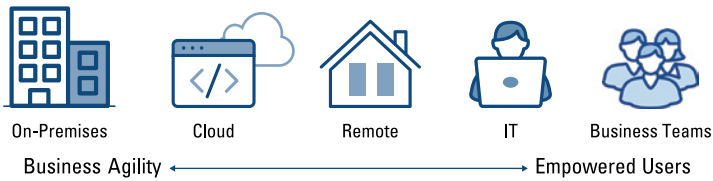

FIGURE 1-1: Embracing the new normal means boosting business agility to respond and execute quickly and empowering large numbers of people to perform their jobs most effectively and efficiently.

Enterprise automation is made possible by proper event-driven integration of applications and data — that is, interconnecting the organization's critical business data and applications, regardless of whether the data must flow from an on-premises location or the cloud. Companies spend big bucks to integrate their essential data and applications. According to market research and

intelligence reports, it's expected that by 2026 companies collectively will spend as much $20.9 billion annually to achieve enterprise application integration (Global Hybrid Integration Platform Market Size, Status and Forecast 2020-2026, `valuates.com`, 2020; `https://reports.valuates.com/market-reports/QYRE-Auto-19J2259/global-hybrid-integration-platform`).

An enterprise automation, or application and data integration, platform interconnects the vital operations of a business. An app and data integration platform enables data and operational information to flow between functional teams like finance, accounting, sales, marketing, manufacturing and analytics, and others. Also importantly, cloud-based app and data driven enterprise automation places companies in a position to effectively and swiftly react to sudden, unexpected shifts in the business climate.

Defining Some Important Terms

As you move through the rest of this book, you'll encounter some industry terms that you may or may not already be familiar with. Here's a cheat sheet for what you need to know.

- *Integration* is the act of interconnecting applications and systems to flow or share data between them for operational, data storage, or data analytics purposes.
- *Operational* means at the time of the business execution or application software activity. In other words, happening in real time or near real-time, important for automating business processes.
- *Application integration* refers to interconnecting two or more applications to flow operational data between them to execute software functions.
- *Data integration* means flowing post-operational data from applications, operational databases, or other systems of record to a data storage repository or data warehouse to consolidate data and/or to perform post-operational analytics on the data.

AUTOMATING THE SUPPLY CHAIN: FROM WAREHOUSE TO THE CUSTOMER

EXAMPLE

Browns Shoes, a family-owned business established in Montreal, Canada in 1940, is synonymous with top international designer collections and exclusive street-savvy fashion for men, women, and children. When COVID-19 hit, very painfully, Browns Shoes was forced to close its 68 stores and reduce a significant amount of its workforce in its distribution center. It quickly shifted the focus of the IT department to support online sales.

Advancing data analytics: Prior to the pandemic, via new business intelligence and data warehousing initiatives, Browns Shoes was looking to better embrace the growing amount of valuable data it collects. When the IT team needed an efficient way to move large amounts of diverse data from the various systems it had into its data warehouse, they sought a modern integration tool to scale the project and make it business ready.

Adapting to sudden change: Overnight, COVID-19 introduced a new set of challenges. After a quiet first week in lockdown, the retailer saw one of its biggest online spikes, over 300 percent sales increase. With this rapid and dramatic increase, the now lean IT and logistics team had to jump into action to quickly ramp and improve processes to meet demanding customer expectations. The agile, modern, intelligent iPaaS enabled Browns to quickly shift from the data analytics project, and in less than two days, develop new applications to support the distribution center. Leveraging front-end applications to bring together data from different systems, in real-time, Browns was in a position to provide quick insights and answers. This helped the reduced workforce to be efficient and able to keep shipping and delivery lead-time promises to customers.

Metrics Achieved:

- Introduced new automation systems to meet changing customer expectations
- In less than 48 hours, built, tested, and rolled out new business applications and processes that led to more timely insights, faster actions and deliveries, and delighted customers

Key Endpoints: FedEx, Salesforce, Amazon Web Services

IN THIS CHAPTER

- Surveying the evolution of integration
- Understanding the difference between data and application integration
- Learning why integration is a critical component for business processes

Chapter 2
Integration: Then and Now

An essential component of enterprise automation is *integration,* which involves interconnecting applications and systems together to flow or share data between them.

This chapter reviews how integration has evolved, and the role integration plays in the success of an organization, company, or enterprise.

How Did We Get Here?

A lot of the enterprise automation and integration features organizations seek today are fairly recent innovations necessitated by digital transformation, cloud migration requirements, and more recently, by pandemic-inspired business strategy changes.

Much of the challenges experienced with integration in current times is because of how computing has evolved from a single, monolithic mainframe environment to the environments of today where applications are everywhere. Spread among multiple systems, data centers, and cloud infrastructures.

Figure 2-1 provides a visual overview of the progression from mainframes to multi-cloud computing (for those who may not be

familiar with the history). The following sections briefly describe each phase.

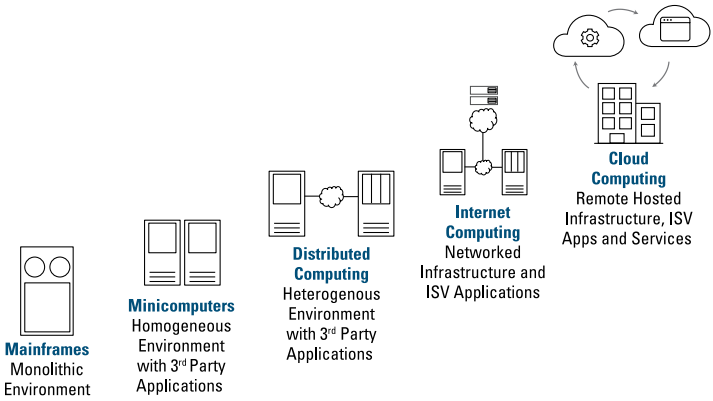

FIGURE 2-1: The evolution of computing.

The venerable old mainframe

Back in the mid-1960s, with mainframe computers, enterprises hosted all the software necessary to support and drive every aspect of the business on a single, monolithic system. IBM and a collection of IBM-compatible system and software developers built all the necessary applications to run the business. Because the mainframe was the main thing, everything was in one place and one system. There was little need for integration.

Serving the small-business market with minicomputers

Early on, only the largest corporate enterprises could afford the large and expensive mainframes. By the late 1970s, IBM began to produce more compact versions. In the summer of 1988, IBM introduced the Application System/400 (AS/400), which was scaled down in cost and physical size, and represented a new family specifically for small- and medium-sized companies. IBM and its partners rolled out over 1,000 software packages for the AS/400, including integration solutions with mainframes.

The rise of distributed computing

In the late 1990s, enterprise information technology (IT) underwent an evolution to distributed computing. The idea was to break

up the monolithic and proprietary computing approach, separating the choice of computing hardware from the choice of applications. This enabled enterprises to access a variety of applications built for specific business functions (accounting, customer relationship management, enterprise resource planning, and so on), most of which were more imaginative and feature-rich than the bland IBM stuff.

Although they were networked together, distributed systems were still essentially a monolithic topology, centered around a dominant database (for example, Oracle) and an orbit of applications. Yet, many corporate environments were still entrenched with proprietary systems, requiring the distributed world to communicate and collaborate with the proprietary world via the new integration solutions that appeared on the scene.

The emergence of Internet computing

In the early 2000s, distributed, networked computing within a company's data center infrastructure gave way to Internet computing services and remote, third party-based infrastructures.

In parallel, new enterprise application alternatives to IBM and Oracle continued to grow. The integration flood gates opened further as data needed to move between traditional proprietary solutions and distributed computing databases and data warehouses, including new data repositories, such as Hadoop-based analytics solutions, which emerged in 2006. Data also needed to move between the thousands of applications connected or hosted through the world wide web, as exemplified by software-as-a-service (SaaS) companies such as Salesforce, which was formed in early 1999. Hadoop platforms and other open source big data ecosystem products were highly technical in nature, requiring (hard to find) specialized talent to keep all the systems up and running and to integrate the numerous permutations of application and data sources and targets.

The popularity of cloud computing

About the same time when Hadoop emerged, mid-2006, Amazon Web Services was formed, offering compute (AWS EC2) and storage (AWS S3) infrastructure resources, effectively for rent, at an hourly fee. Due to the laborious complexity, difficult scalability, and manpower concerns to manage physical data centers, third-party hosted infrastructure was a compelling proposition: no

compute or storage infrastructure assets to acquire and manage, unlimited scalability, and nimble agility. What was not to like?

Security was an initial hurdle. However, once security concerns were addressed with more robust offerings, among other things, cloud computing became generally accepted and took off. Company information technology (IT) departments never looked back.

For 2021 and beyond, what can be said about the popularity of the cloud computing model that has not already been said? According to Gartner (Forecast: Public Cloud Services, Worldwide, 2018-2024, 3Q20 Update; `https://www.gartner.com/document/3991263?ref=AnalystProfile`), worldwide spending on public cloud services is projected to grow 18.4% in 2021 to a staggering total $304.9 billion, up from $257.5 billion in 2020.

From mobile apps and SaaS applications to data platform cloud services to multiple cloud providers, companies are clearly heavily invested. In all its forms: public cloud, private cloud, and combinations of the two.

Moreover, for its public cloud forecast, Gartner further indicates, "The pandemic validated cloud's value proposition. The increased use of public cloud services has reinforced cloud adoption to be the new normal, now more than ever," said Sid Nag, research vice president. Gartner expects the proportion of IT spending that is shifting to cloud will accelerate in the aftermath of the COVID-19 crisis.

REMEMBER

Today, integration has grown to a multi-billion-dollar industry to interconnect the data and applications that are critical to business operations of companies everywhere. Despite their age, older legacy systems remain in production. Company computing platforms are spread between on-premises data centers, public cloud services, and private clouds. Applications must integrate and data must be shared across all these systems.

Exploring the Different Types of Integration

The following sections dive deeper into data and application integration and have a look at each type.

Data integration

REMEMBER

Data integration is the act of consolidating or combining information from one or more sources, regardless of format, into a destination system that serves as a common, unifying data structure, as shown in Figure 2-2. Legacy approaches perform this task, generally, in a batch manner, perhaps once a day. More modern approaches employ streaming. Common goals for data integration include providing users a unified view of multiple sources of data and fostering collaboration between workgroups around data. Other goals include performing analytics on the gathered data for business intelligence and data-visualization purposes. The data pool that data integration generates is typically used for post-production, non-real-time analysis, business intelligence (BI), and reporting.

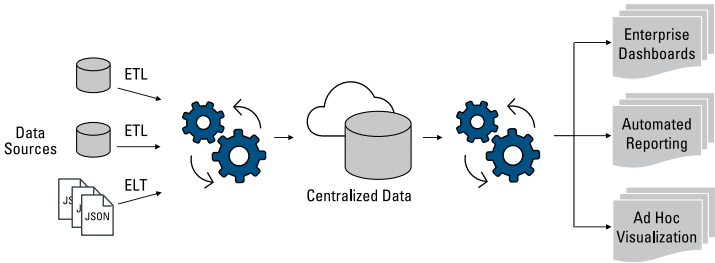

FIGURE 2-2: Data integration combines datasets from multiple sources, regardless of format, into a single data structure.

Source systems run the gamut from computer systems and databases that support production environments, to ERP systems, to weblogs from e-commerce websites. For example, to form a 360-view of a customer, a company may need to combine the customer's order history data in an Oracle database with clickstream data in a website's backend database and with sentiment data pulled from social media channels.

The integration solution extracts the data from source systems, or systems of record, and transforms the data as necessary to fit within a needed structure as defined in the destination system. The transformation happens within the integration solution as part of the data pipeline to the destination data structure. The integration solution then loads (inserts) the various data into the destination system. The complete process is referred to as *Extract-Transform-Load (ETL)*.

Extract-Load-Transform (ELT) is a variation of ETL. In this case, the integration solution extracts the data from source systems and immediately loads the data into the destination system. The destination system then takes over to perform any needed transformation (such as restructuring, sorting, or aggregation of the data) for downstream business intelligence, analytics, reporting, or visualization purposes. When the transformation work is shifted from the data pipeline (created within the integration solution) to the destination data structure (such as a data warehouse), it's sometimes called pushed-down optimization.

Application integration


REMEMBER

Application integration is all about directly linking two or more applications, often in real-time, so they can communicate and share operational data between them. In other words, the data output from one application is used to feed the data input requirements of another application. (See Figure 2-3.) The integration solution maps and transfers record-level data between the applications for real-time enterprise workflow purposes.

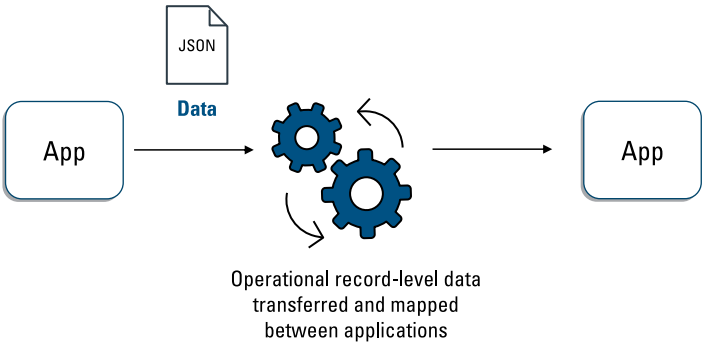

FIGURE 2-3: Application integration is sharing record-level, operational data between two or more applications.

To link applications, an integration solution uses *application programming interfaces (APIs)*, an intersection that enables intermediaries and diverse software solutions and services to communicate with one another and exchange data. Most popular applications include APIs as an integral part of their environment. In Chapter 4, you find out about two standard and popular API methods: SOAP and REST.

Besides the post-production nature of data integration and the real-time nature of application integration, another prime difference between application integration and data integration is the size of the datasets. Data integration works with sets of data. Mountains of data may be moved in large batches or in multiple chunks of small parts of a dataset. Datasets can range in size from gigabytes or terabytes, which is not uncommon. The idea is that more data creates deeper or broader possible insights. Depending on the complexity of the analytics, once the data is loaded, it may take a single analyst a few minutes to perform the analytics, or it may take a team of analysts or data scientists months to develop insights from the data.

Application integration, on the other hand, moves mainly document or application-level, transactional data. The amount of data may only be kilobytes or megabytes at a time. The required response time to act on this data typically is sub-second. The audience for application integration tends to be more business users or line-of-business oriented (LOB), performing a business process, such as marketing automation or quote-to-cash.

Identifying Integration's Role in Enterprise Organizations

REMEMBER

Enterprises everywhere require different applications to interact with each other. Enterprises also have an insatiable appetite to glean as many insights as possible from all types of data sources. Data may be generated in house, or in-house data may need to be combined with third-party data. In all cases, a powerful integration solution is required that's designed specifically to mobilize and orchestrate the combination of data and application integrations across the enterprise.

This is where solutions such as integration platform as-a-service (iPaaS) come in — particularly, a modern, intelligent iPaaS solution capable of combining data and application integration capabilities within a single, homogeneous solution. (See Chapter 6 for more,) With a modern, intelligent iPaaS complement (as *middleware*), sitting in between an organization's data platform and applications, businesses are free to focus more strategically on extracting value from their data and applications stack.

GAINING REAL-TIME DATA INSIGHTS FOR BETTER RESULTS AND CX

EXAMPLE

A German multinational conglomerate, Siemens is the largest industrial manufacturing company in Europe with many business divisions, including Siemens Digital Industries, Siemens Energy, Siemens Healthineers, and more.

Orchestrating data to deliver digital CX: The customer service (CX) organization, which comprises of service engineers, application specialists, and healthcare consultants at Siemens Healthineers serves more than 120,000 customers worldwide in 150 countries. They pride themselves to always be in-touch and to always serve their customers. Because they provide a business-critical service, they need access to connected user experiences and move away from complex and disparate data silos that delay responses to their customers. By automating applications across their digital landscape, Siemens can see customer touchpoints, and provide more customized service and care.

Gaining real-time data for reporting: Business and sales stakeholders at Siemens Digital Industries needed a better approach to obtain order data quickly so they could process and deliver orders faster. They'd receive data that was 2 to 3 weeks old, which risked business operations and the accuracy of sales reporting. In addition, these stakeholders had to make manual interventions to fix broken processes.

To resolve these challenges, Siemens used a modern, intelligent integration platform-as-a-service to make multi-point integrations and manage the entire data lifecycle, across multiple applications, so that stakeholders can visualize their data in real time.

Metrics Achieved:

- Reduced 2 to 3 week latency to zero, gaining real-time logistic data for effective order management
- 5 times increase in productivity amongst business and IT users by using a faster, more intuitive integration approach
- Improved efficiency and accuracy enabling product, logistics, and order teams to generate accurate and timely reporting

Key Endpoints: SAP, ServiceNow, Microsoft Azure, Snowflake

IN THIS CHAPTER

- Learning how businesses are shifting to cloud technology
- Understanding the problems that silos create
- Deploying a modern, intelligent iPaaS to boost digital transformation success

Chapter 3
Why Digital Transformation Projects Fail

Behind every modern company's compelling mission statement and laser-focused objectives is a collection of business software applications that power the company to achieve its goals. Even so, companies are still under constant pressure to deliver improved business results. To succeed in today's environment, an enterprise must be able to deliver products and services to market faster, improve customer experiences, and increase profitability.

To achieve these goals, many companies have pursued digital transformation initiatives in an attempt to increase agility and enhance competitiveness. Yet in many cases, digital transformation hasn't been the magic bullet that they expected. Why not? That's an excellent question, and the subject of this chapter.

This chapter explains how movement to the cloud has solved many enterprise IT problems, but it has also allowed application stacks to proliferate and decentralize to the point where they become disconnected and unmanageable. This chapter ends by proposing a modern, intelligent integration platform-as-a-service (iPaaS) as a compelling solution to integrate applications and share data.

Moving to the Cloud

No matter what tasks a business needs to accomplish, *there's an app for that,* as the popular saying goes. Software applications are the cornerstone of modern business processes, handling everything from onboarding new employees to managing monthly financial book closings. Every company's software needs are different, so there's not usually a single application that can do everything an enterprise needs to do. Companies typically assemble together multiple applications to create specific workflows for each department or division.

Why companies "go cloud"

Just a decade or so ago, companies usually maintained and deployed these software stacks from their own internal data center. However, in today's business environment, companies constantly feel pressure to get more done or risk getting left behind. To this end, many companies have moved to cloud-based technologies in an attempt to gain a competitive advantage, and each year more and more companies make the shift.

REMEMBER

Early on, the primary reason businesses moved to the cloud was to cut costs. Nowadays, however, businesses are adopting cloud technology to improve agility, scale, and execution speed. In *CIO Magazine* (January 2019; `https://www.idginsiderpro.com/article/3336856/gartner-cloud-enterprise-software-to-drive-global-it-spending-increase.html`), Gartner analyst, John Lovelock, put it like this:

"Though cost optimization is important, it's not the main reason for moving to cloud services and applications. The fact that we're going to cloud is more about agility, getting the feature functionality you need at the speed you need it. Digital business runs at a much faster speed than [bricks and mortar] business; hyperscale data centers are the only things that can support the speed of digital business, the cooperation required in digital business — it's very difficult to do that on-premises."

Perceptions have changed as well. As editor-in-chief of *InfoWorld*, Eric Knorr expressed in a June 2020 online article:

"It wasn't long ago that IT managers faced resistance and pushback when they recommended cloud-based applications or infrastructure. Today, pushback is more likely to come if they don't deploy in the cloud."

THE CURRENT STATE OF CLOUD COMPUTING

Research firm IDG indicates in its June 2020 cloud computing study (https://www.idg.com/tools-for-marketers/2020-cloud-computing-study/) of 500 IT professionals that 92 percent of organizations are now at least "somewhat" in the cloud. Further, within the next 18 months, the survey respondents expect cloud software-as-a-service (SaaS) applications will account for a 36 percent share of all deployed applications, up from 24 percent. Other research indicates that for many organizations, SaaS applications have a majority share of all deployed applications.

From a COVID-19 pandemic perspective, cloud computing is critical to enable self-service and self-sufficiency for workers forced into remote working environments. A July 2020 McKinsey Global Survey (https://www.mckinsey.com/business-functions/strategy-and-corporate-finance/our-insights/how-covid-19-has-pushed-companies-over-the-technology-tipping-point-and-transformed-business-forever) of 899 C-level executives and senior managers indicates companies, in just a few short months, moved 40 times more quickly to boost support for remote workforces than they thought possible before the pandemic.

In a similar survey of 2,500 IT professionals conducted by Twilio, a cloud communications services company, the COVID-19 pandemic increased cloud adoption and accelerated digital transformation strategies for 96 percent of the surveyed companies. The amount of acceleration was as much as six years. (COVID-19 Digital Engagement Report, Twilio 2020; https://www.twilio.com/covid-19-digital-engagement-report).

How companies end up with so many apps

Once a company breaks the confines of physical, on-premises data centers, a significant benefit of cloud computing is the ability to embrace and adapt best-in-class SaaS applications. And there are so many good ones to choose from! IT and lines-of-business (LOB) managers can choose from among thousands of high-quality, cloud-based applications in areas including payroll,

IT administration, human resources (HR), employee performance management, customer relationship management (CRM), data warehouse, and analytics.

SnapLogic, together with research firm Vanson Bourne, surveyed 500 IT decision makers in the US and the UK and found that enterprises have an average of 115 applications. It's not unusual for large enterprise organizations to have as many as 400 applications in their cloud application stack (State of Data Management — Why Data Warehouse Projects Fail, August 2020. Seeing How Silos Form — and Why They're a Problem; `https://www.snaplogic.com/resources/research/the-state-of-data-management`).

Once applications are deployed, the ideal is to share data freely between all the applications that must interoperate with each other. But this does not happen naturally, and according to the aforementioned Vanson Bourne study, 500 IT decision makers indicate 49 percent of applications are disconnected. It's said best in the words of a data services director at a leading identity governance software company:

Different applications have varying states of integration capabilities. Some applications connect well with others, and others do not. Some applications are easy to read data from, and some are not. The documentation and methods that an application provides for facilitating integration can range from excellent to extremely poor.

WARNING

When it isn't easy to connect and integrate applications, it often doesn't get done. *Silos* spring up, which are areas in which applications and data are separated from one another by incompatibilities and/or lack of integration support. Figuratively speaking, it's as if brick walls are placed between applications. These brick walls disrupt the flow of data between applications, and between applications and analytics platforms (see Figure 3-1). Integrations become stalled as the IT department labors to build integrations or find workarounds. Response times are delayed, and ultimately, the business makes decisions based on incomplete or out-of-date information — leading to costly mistakes and slow results.

The problem doesn't stop there, though. There's a domino effect. To work around IT bottlenecks and speed up results, individual business groups take matters into their own hands and create what amounts to a shadow IT effort. Groups attempt to build their own cloud stacks and make their own one-off integration attempts.

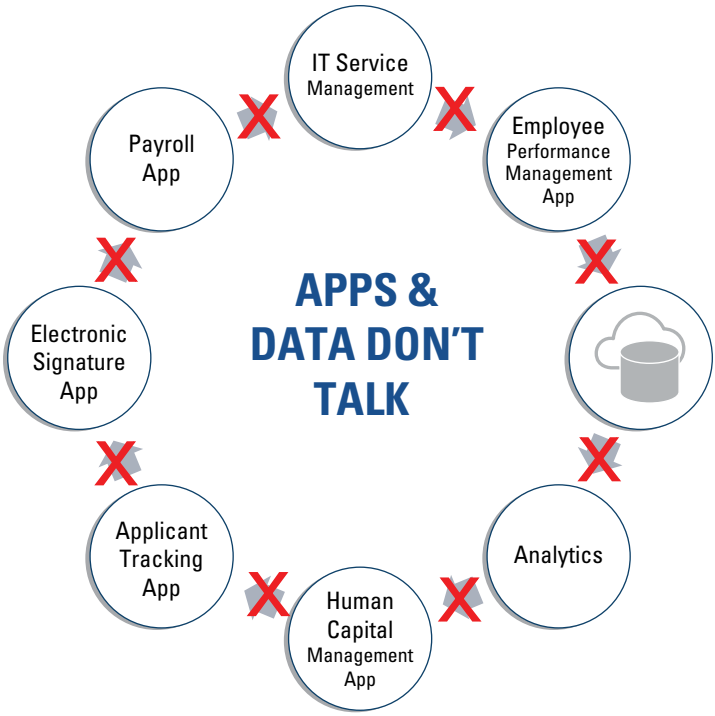

FIGURE 3-1: Without modern application and data integration, enterprise wide data flows between applications and analytics are disrupted.

Assuming groups are not stopped in their tracks by application integration programming efforts that are too technical or difficult to learn, the number of tools proliferate, and one-off integration costs increase. Besides placing a hit on budgets, these shadow IT efforts eventually also add burdens on IT to wrangle all the one-off integrations (if an organization prefers to have integration efforts centralized).

Lacking a universal platform to manage all integrations, groups rely heavily on the in-the-box integration tools (if they exist) for each SaaS application. Often this means application lock-in develops, creating less flexibility to create multi-point integrations across those enterprise applications.

REMEMBER

This is a problem because many business processes require data operational data to flow between multiple applications. When you're not able to build multi-application data flows, you're less able to build fully integrated, end-to-end business processes that move your business forward.

Consequently, data is manually shuttled around, if at all, resulting in less insight across the complete environment, and it becomes tougher to identify the data gaps or duplication. Data standardization becomes tougher to achieve, and that may have an impact on the quality of enterprise-wide data.

UNLOCKING INNOVATION THROUGH DATA AND AI SERVICES

EXAMPLE

Aramark is a $15B (USD) company and a leading global provider of food, facility, and uniform services. The company deeply invested in data and artificial intelligence services to fulfill its brand's promise of delivering exceptional services where people work, learn, recover, and play.

Breaking down data silos, gaining a single source of truth: Before undertaking its AI initiative, Aramark had pockets of data buried in silos across its different business segments. The data was difficult to access, preventing executive and analyst stakeholders from having a broad view and the confidence to make business recommendations.

Aramark undertook its AI initiative to build a data platform, named Marko, to deploy and activate a single source of truth. With a modern data and application integration platform as the underlying enabler, the Marko data platform helps Aramark departments and business units to mobilize, mine, and share operational, transactional, and analytics data. Aramark also enriched the data with AI and machine learning so that stakeholders have data trends without sifting through millions of rows of data. Embedding AI and machine learning was made possible through connecting on-premises and cloud applications, point-of-sales (POS) data, and external sources such as weather data. Stakeholders now make better business judgments.

Optimizing business operations: Speed is key when it comes to servicing at facilities, schools, or events. Aramark automated its POS

processes such that employees could use scanners to total an order and not have to manually enter food items, avoiding data entry errors.

Increasing sales transparency, driving employee productivity: Aramark is equally committed to making its employees successful as it is to improving sales revenue. By flowing and integrating data from POS with HR systems, the company can proactively reward top employees while identifying and providing more training to employees that need it. Additionally, the company can identify the health of sales by region or event and pinpoint whether sales were impacted by weather, attendance, or other factors.

Metrics Achieved:

- Transitioned existing data resources quickly and easily
- Scaled to over 100 APIs servicing over 6 million requests per month, in weeks instead of months
- Automated end-to-end processes, reducing error-prone manual data entry
- Sped integrations with a low/no-code integration approach, eliminating hand-coded integrations

Key Endpoints: Salesforce, Microsoft SQL Server, Oracle, Snowflake

Boosting Digital Transformation Success with Modern, Intelligent iPaaS

It seems obvious that if you want to boost the success of digital transformation strategies, you should remove the brick walls and break down the silos between applications. As data flows more freely between applications, you're better able to construct broad end-to-end journeys that contribute a bigger impact on your business.

Sounds simple, doesn't it? Applications and data just need to be seamlessly integrated. But it's much easier said than done. Typical legacy integration approaches involve clumsy interfaces and a lot of hand-coding that can take months to implement. Such bad interfaces and long delays create an environment that encourages counterproductive shadow IT efforts.

REMEMBER

A better way is with a modern, intelligent *integration platform-as-a-service (iPaaS)* solution that delivers the next wave in integration. An intelligent integration iPaaS:

- Is cloud-built for fast performance, quick deployment, and agile scalability.
- Provides a hybrid of application and data integration, supported by a large portfolio of endpoint connectivity.
- Features an intuitive, artificial intelligence (AI) driven, visual drag-and-drop interface that provides a superior ease-of-use experience.
- Eliminates or significantly minimizes hand coding.
- Empowers technical and non-technical, "citizen integrators" to build multi-point app and data integrations.
- Enables automated, end-to-end business journeys.

Backed by enterprise-level security, a modern, intelligent iPaaS enables organizations to build integrations across a diverse set of applications that may be hosted in various clouds, and integrations of data that reach down to legacy environments still hosted in on-premises data centers. A modern, intelligent iPaaS delivers data payloads to data lakes or data warehouses at whatever velocity is required: real time, streaming, or batch.

With a modern, intelligent iPaaS, you're in a better position to create end-to-end business journeys across ERP, CRM, HCM, and other enterprise applications. You can also add time-based or event-driven triggers that automate the flows of data, which is the key to achieve enterprise-wide automation. Imagine simplified manageability to view and orchestrate all pipelines and integrations through a single, unified integration platform command center.

A modern, intelligent iPaaS includes hundreds of pre-built connectors that save weeks of work both in development of those interfaces, and also in the maintenance of them as the application and data endpoints evolve. One of the benefits, the agility, can also be one of the dangers. You're better able to respond to organizational, business, or market changes more quickly — the global pandemic crisis is a case in point. You can also engage customers, internal business partners, and external business partners with greater speed and efficiency.

IN THIS CHAPTER

- Learning why enterprise integration matters
- Reviewing some older integration technologies
- Understanding how application programming interfaces (APIs) work
- Comparing SOAP and REST APIs

Chapter 4
Reviewing Application Integration Approaches

Enterprise automation, the dynamic flow of operational data between applications, begins with application integration. As explained earlier, application integration is a decades-old challenge. Companies spend enormous sums on different approaches that promise to resolve application integration problems. Just how enormous are we talking about? The annual market size for integration platforms ranges from $15B to over $30B. This industry is also experiencing modest compound annual growth, 7 percent to over 14 percent, depending on the source of the research (Global Hybrid Integration Platform Market Size, Status and Forecast 2020-2026; `https://reports.valuates.com/market-reports/QYRE-Auto-19J2259/global-hybrid-integration-platform`).

This chapter takes a deeper look at the various integration approaches. No two companies are alike and the integration options to consider vary widely.

Why Enterprise Integration Matters

Companies of all sizes have struggled with application integration ever since computing became more distributed. Particularly in large enterprises, applications and servers are often spread across different systems, and systems are spread across different operating groups.

While the bulk of the integration challenges can be attributed to the number of applications that need to work together — counted in the hundreds for large enterprises — the number of applications isn't the only factor. Integration challenges also arise with system generational changes and with new deployment options.

Adding to the generation upgrade challenges are groups of users that don't move along to the new-generation system. Reasons for hangers-on may be legitimate: Necessary functionality in the old system might be lost in the new system or, users might require a lengthy migration period. Costs may be a factor as well. There's nothing like the high price of a new system to stretch an older generation system's longevity.

REMEMBER

Physical data centers have given way to cloud-based infrastructure in today's enterprise IT operations. However, complete migration away from a legacy system rarely happens overnight. Just because you "lift-and-shift" your legacy applications to run them in the cloud, you need to adopt newer SaaS-based applications to realize the true benefit. It's not unusual to require a few years to complete a full migration from a physical data center to the cloud, including the data warehouse. Furthermore, some companies prefer to maintain certain data sets on-premises. In light of this, many companies employ a hybrid model that includes both on-premises and cloud computing.

Taking all this into consideration, it's easy to understand the need for an enterprise application integration platform. Selecting the best approach and making it happen is another matter.

Looking Back at Older Application Integration Approaches

To understand the current state of enterprise application integration, it's useful to know what kinds of integration solutions have emerged over the years and how they still affect integration efforts today. The following sections take a look at a couple of older technologies that still impact the way enterprises integrate applications and data today: electronic data exchange and remote procedure calls.

Electronic data interchange

Electronic data interchange (EDI) standards were an early method for enabling companies to share information between systems. They're still in heavy use today by many retailers and industries dealing with commodity or standards-based products, although they've been eclipsed in popularity by more advanced methods.

Used as a mechanism to transmit information such as purchase orders (PO), invoices, financial records, and patient records, EDI enables companies to avoid having to flow information between systems on paper. In earlier times, EDI information transacted through private networks, via telnet, or via physical data storage media. Today, however, EDI is executed primarily through email, FTP (file transfer protocols), or web interfaces.

EDI has been around since the 1970s and there are dozens of standards that define and stipulate EDI message data structure requirements. Simply sending and receiving binary or text files doesn't constitute EDI.

The technology basis for EDI, like many other early information technologies, has its roots in the military. During wartime efforts in the mid-20th century, the amount of transactional information shared between the government and contracting parties was so voluminous that something had to be done to reduce the flow of paper and the time for clearance. Freight control systems were among some of the first integrated systems using EDI. The automotive industry was also an early adopter of EDI.

Today, through HL7 (Health Level Seven) and HIPAA (Health Insurance Portability and Accountability Act) standards, the healthcare and insurance industries are heavy users of EDI methods. The retail industry, led by behemoths such as Walmart, Target, and Amazon, are backers of EDI standards such as AS1 and AS2 (Applicability Statement 1 and 2) to exchange information with their supply chain vendors.

Remote procedure calls

During the 1980s and 1990s, alternative approaches to EDI evolved to integrate and exchange a broader range of information. During this time of increasing popularity of distributing computing, application developers began to include the hooks necessary to engage other systems that contributed data and/or services to complete or enhance the application's experience.


TECHNICAL STUFF

In software engineering lingo, a *remote procedure call (RPC)*, a term coined in the early 1980s, is a request-response subroutine (protocol) that executes outside of the local system that hosts the application. The local system (the client) initiates an RPC by sending a request message to a known remote system (the server) to execute a specified set of instructions or procedures. The results of the procedure are then returned to the client, which then continues with its processing.

RPCs come in many flavors and varieties, often requiring developers to stay on top of differences to avoid incompatible protocols during the request-response process. RPCs are also exposed to failures caused by unpredictable network challenges and a multitude of reasons. The poor developer bears the burden of troubleshooting (without knowing if a remote procedure succeeded). Techniques (such as idempotent procedures) can be implemented to assure a remote procedure is executed only once, even if the remote system is contacted more than once for the same request.

Due to these issues, RPC usage was limited. In the late 1990s, RPCs evolved further to adopt the XML (Extended Markup Language) data framework to exchange information, making RPCs more viable for a wider range of business-to-business and systems-to-system information exchanges — particularly across the Internet. Ultimately, methods such as RPC-XML were precursors to Internet-friendly APIs such as SOAP and REST, which you find out about shortly.

Understanding Application Programming Interfaces

Application programming interfaces (APIs) are a more recent method of enabling multiple applications to communicate with one another — particularly across the Internet and mobile devices.

What's an API?

An API is a software framework, commonly formatted as an XML or JSON (JavaScript Object Notation) text file. The goal of an API is to get access to data so that multiple applications and services can work together. To create a complete application-user experience, it's common for application developers to rely on data or functionality provided by other applications or services. The advantage to the developer is when an application calls upon and makes a request from another application or service through an API, the developer doesn't have to be concerned with the inner workings of the remote application or service. Thus, APIs hide complexity, and allow the application developer to deliver more functionality.

APIs are much like waiters at a restaurant. When you patronize a restaurant and you place an order for some food, you interact with the waiter. Through the waiter, you can order a meal or drinks, ask questions about the menu, and pay your bill. The waiter is your connection to the restaurant's kitchen, without you having to stress out about the inner workings of the restaurant: the kitchen's stove, cooks, food delivery, dishes, or other kitchen operations. The waiter abstracts all this complexity from you.

For developers, APIs operate in the same fashion. APIs enable developers to access data, perform tasks such as security, and extend the functionality of an application, without developers having to waste precious time figuring out how another system works. The developers just need to know how to use the APIs to engage the other applications. Once understood, based on a menu of available API functions from other applications or services, developers then incorporate that functionality via the API into a company's application.

The degree to which applications offer APIs varies, depending largely on how important connectivity with other applications is to the application's functionality. A stand-alone application,

whose operation is highly self-contained, has a lower need for an API. Likewise, older applications that were born in the age of mainframe computing may only have a small set of available APIs, if any.

On the other hand, applications and platforms such as Salesforce.com and Google — whose business models are highly dependent on connectivity — have an army of API developers. Their jobs are to produce a menu of APIs for other application developers to take advantage of, to engage with Salesforce or Google data and services.

How APIs work

Calling an API can be a simple one-liner statement, such as the following, inserted into an application, which will have additional code to process, or "consume" the data from API request:

```
GET https://www.googleapis.com/drive
/v3/files/createdTime
```

Listing 4-1 illustrates an HTML5 type of geolocation function. A web-based application might call this function when it has a need to pinpoint your physical location. The application that employs this function needs only the location data that's returned. Developers don't have to worry about how the mapping or GPS service (that provides the data) actually works.

LISTING 4-1: API Example for a Geolocation Service

```
function geoFindMe() {

 const status = document.querySelector('#status');
 const mapLink = document.querySelector('#map-link');

 mapLink.href = '';
 mapLink.textContent = '';

 function success(position) {
 const latitude = position.coords.latitude;
 const longitude = position.coords.longitude;
```

```
 status.textContent = '';
 mapLink.href = `https://www.openstreetmap.org/#map=18
/${latitude}/${longitude}`;
 mapLink.textContent = `Latitude: ${latitude} °,
Longitude: ${longitude} °`;
 }

 function error() {
 status.textContent = 'Unable to retrieve your
location';
 }

 if(!navigator.geolocation) {
 status.textContent = 'Geolocation is not supported by
your browser';
 } else {
 status.textContent = 'Locating...';
 navigator.geolocation.getCurrentPosition(success,
error);
 }

}

      document.querySelector('#find-me').
         addEventListener('click', geoFindMe);
```

Source: https://developer.mozilla.org/en-US/docs/Web/API/Geolocation_API

Another example is a payment solutions API. Ecommerce website developers require a checkout method to securely collect money from buyers. Rather than build this capability themselves, the developers would simply contract with a payment solutions service provider, such as PayPal (a free, public API), and then add the associated payment solutions API into the code for the ecommerce website. The payment solutions vendor provides all the guidelines necessary to assure the checkout and payment process is properly rendered and presented to the ecommerce website's visitors.

Surveying Some Commonly Used APIs

This chapter wraps up by taking a look at two popular modern API types: SOAP and REST. It considers each one separately and then offers a quick compare-and-contrast.

Cleaning up with SOAP APIs

As alluded to earlier in the chapter, there are various EDI standards and RPC methods. Compatibility issues between methods can create complexity, compatibility, and scaling problems as the volume of data exchanges between systems grows or as new lines of code need to be written. The SOAP API, which first released by Microsoft in 1998 and gained popularity in the early 2000s, was designed to address this problem.

SOAP (Simple Object Access Protocol) is an API that is described in what is known as Web Service Definition Language (WSDL), which is an XML-based language. The WSDL describes the operations and services provided by the API, along with the formats of the inputs, outputs, and error conditions. These prescribed interactions can be used or interpreted by a wide variety of applications and technologies that use the protocol. Like a contract between SOAP API provider and consumer, when an application developer (the consumer) engages a service that employs SOAP APIs (the provider), the developer must adhere to the explicitly defined WSDL procedures for submitting requests to the service. In turn, for its responses, the service adheres to and delivers explicitly defined operations. The aforementioned PayPal API is a SOAP-based API.

SOAP APIs enable developers to worry less about variability and compatibility concerns. SOAP APIs can also be executed across a number of different networking transport protocols, including HTTP, SMTP, TCP, and UDP.

Taking a breather with REST APIs

SOAP APIs can sometimes be a burden on developers because of all their rules and rigidities. Sometimes a developer needs a quick

and dirty way to exchange data without all the hassle. Enter REST APIs, described by Roy Fielding in 2000 as part of his PhD thesis.

REST is an abbreviation for *REpresentative State Transfer.* Rather than being a formal protocol like SOAP, REST is more of a well-defined architectural approach for connecting applications. When a written API follows the architectural approach as defined by REST, the API may be described as a RESTful API.


TECHNICAL STUFF

Whereas SOAP is strictly tied to XML, REST APIs are more closely aligned with the JSON data exchange format. Data can be exchanged in a variety of formats, including text and comma-separated values (CSV). In developer software speak, JSON is considered to be more lightweight and less verbose than XML. In addition, REST APIs got its own description format in the form of the Open API (OAS v3) Specification, which evolved from the so-called "Swagger" definition. The definition allows the REST based services (inputs, outputs, and expected responses) to be described, which are similar to the aforementioned SOAP Web Service Definition Language. For these reasons, compared to SOAP, REST APIs offer development simplicity in the form of fewer security requirements and less strict scripting efforts.

The further we progress in the 21st century, the greater the degree of popularity of REST APIs.

Comparing SOAP and REST

Within API developer communities, there is much discussion and debate about the differences between SOAP and REST APIs and which is best. Ultimately it comes down to defining what's needed from the API.

Because of its robust feature set, SOAP is popular for security-conscious, enterprise-grade applications such as banking, finance, and insurance. For example, SOAP includes support for transactional consistency assured with ACID compliance.

WHAT IS ACID?

ACID is an acronym for **A**tomicity, **C**onsistency, **I**solation, and **D**urability, and is a form of high integrity transactional data processing that has been around for decades. Systems that engage in sensitive transactions such as ATM or credit card transactions, or applications and services that must process sensitive personal information like social security numbers use ACID compliant processing. A transactional process is considered ACID compliant when it meets the following requirements:

Atomicity — All or nothing. Related, connected operations within a transaction must be committed as a complete unit or none at all.

Consistency — After a transaction is completed, all systems or databases involved must be placed into a new valid state. If there's a failure in any part of the transaction, the entire transaction is rolled back and all systems and databases are returned to their initial state before the transaction started.

Isolation — In the event of concurrent (simultaneous) transactions, all are independent of each other. The results will be the same as if each transaction was executed sequentially.

Durability — Even in the event of a system failure, completed transactions retain their results.

REST is best when fast response-time performance is required, such as in a web-based, cloud or mobile environment. Developers using REST enjoy easier scripting (with simple HTTP verb expressions such as Get, Put, Post, and Delete) and greater degrees of flexibility. See Table 4-1 for more specific comparisons.


TIP

As is typically the case with technology choices, clearly defining the requirements up front and understanding the needs of the environment allows you to choose the best API tool for the application integration job at hand.

TABLE 4-1 SOAP and REST Comparison

	SOAP	REST
Transfer Protocols	HTTP/HTTPS, SMTP, TCP, UDP and others	HTTP/HTTPS
Security	WS-Security, HTTPS, SSL, Error Handling (built-in retry logic)	HTTPS, SSL
Message Format	XML and extensible	HTML, XML, JSON, CSV, YAML
Best Uses Cases	Enterprise, Healthcare, Finance, Distributed environments, Transactional (ACID)	Web Applications, Faster response-time performance, Point-to-Point integrations, Stateless
Scripting Efforts and Overall Complexity	Highest	Lowest
Popular Analogy	Like sending a postcard inside of an envelope	Like sending a postcard
Popularity	A longer tenured protocol, more established with security and reliability sensitive, distributed application developers and integrations	The API of choice for today's app developers, enabling faster and simpler consumption across enterprise, SaaS, and mobile applications

EXAMPLE

SAVING LIVES BY LAUNCHING NEW DRUGS AND VACCINES

AstraZeneca is a multinational pharmaceutical and biotechnology company with a wide portfolio of drugs and vaccines for major diseases.

Bringing new drugs and vaccines to market: AstraZeneca's success depends on moving quickly. Research teams share clinical trial information with internal teams (R&D, manufacturing, and marketing) and external entities. This includes contract research organizations and government officials that must review and approve research data before clinical trials can proceed. AstraZeneca had a need to compile

(continued)

(continued)

patient and testing data residing in disparate systems, making it virtually impossible to share data with external entities in a timely manner. After implementing a modern, intelligent iPaaS, research teams are now able to automate data across multiple systems so that other teams and organizations can review and approve research data, speeding up the entire clinical trial process, and launching new drugs faster.

Unifying all data: As the company adopted new applications, either organically or through acquisitions, more integration workarounds, hand-coding, and point-to-point integrations were required. This created costly delays. The company retired the legacy data platform and built a new data platform by connecting multiple on-premises and cloud applications and a popular cloud data warehouse as the new central repository. Employees can more easily access data they need, when needed.

Empowering citizen integrators: More than 450 employees (non-IT users) can now connect data sources to analyze the data they need and make better business and research decisions, freeing IT to focus on more strategic projects.

Metrics Achieved:

- 29 billion documents processed per month across 5.4M pipeline executions
- Over 1,000 integration pipelines connecting dozens of applications, and consolidating databases into their central data platform
- 450+ non-IT users building integrations from around the world

Key Endpoints: Amazon Redshift, Amazon S3, Anaplan, Box, custom connections via SOAP and REST APIs, Facebook, Hadoop, LinkedIn, Microsoft SQL Server, Oracle, PostgreSQL, SAP, Salesforce, Twitter, Workday

IN THIS CHAPTER

- Understanding why data integration is important
- Choosing between moving data or not moving data
- Appreciating new methods of integrating data

Chapter 5
Demystifying Data Integration

As you've probably gathered by this point, managing and automating enterprise data and applications can be a messy, complex endeavor. In other words, "It's complicated."

Perhaps you operate an on-premises data center where you must jump through hoops to connect with a broader range of outside data. Or, despite the rapid growth of cloud computing, maybe you are still dealing with legacy systems — maybe even a venerable old mainframe.

Even if your organization is 100 percent in the cloud, you almost certainly have dozens — if not hundreds — of cloud SaaS solutions that you struggle to integrate and interoperate. You may be overwhelmed and suffering the business consequences. You're probably feeling the pain every day, or at least suspecting that there is a better way.

This chapter looks at some real-world examples that illustrate why data integration is important. It then reviews some different methods of integration and looks at their pros and cons, and explains some of the benefits of choosing a modern, intelligent iPaaS for your data integration needs.

Why Data Integration Matters

To better understand how data and application integration and automation can affect the bottom line, consider a couple of real-world scenarios.

Suppose that your CEO logs into her virtual office on a Monday morning and sees a concerning declining trend over the last year from one of your largest customers. She wants to know the account sales trend over the last two years, but her dashboard shows data from only the last year. She engages her sales ops team and discovers that, alas, two years of data isn't stored anywhere because the extra data is expensive to maintain in your data warehouse. This leaves the CEO at a dead end.

Now imagine that your marketing department consumes social media information from Twitter and LinkedIn, providing insights into the sentiments of your target audience. While the information is useful, it's formatted as JSON and it's difficult to combine the JSON data with the other structured data in the company's database. The company has limited (that is, strained and always busy) technical resources capable of transforming the JSON file and creating a queryable schema that could be joined and related with other marketing data. The data therefore remains siloed, and the marketing team can't achieve the deeper insights it needs, in a timely manner, to make marketing programs more effective. By the time the data is transformed, it will be stale.

Variations of these scenarios happen every day in companies everywhere. The longstanding challenge has been to combine data from different sources to enable companies to realize the full potential of their data.

Comparing Data Integration Methods

REMEMBER

Without unifying data, it's difficult to achieve the broader insights that your organization needs. Here are some of the most common and effective methods of integrating and unifying data.

Data federation

Federation is an integration and access layer that sits atop disparate and distributed data sources and enables them to be accessed as if they were a single source, as shown in Figure 5-1. The benefit of federating data is that you leave data at the source systems, avoiding data migration efforts and the cost of having a separate data store to consolidate the data. The federation tool orchestrates access to the data and provides a unified view of the disparate data. Some federation offerings provide a data query engine as well. Other federation tools provide application access to the distributed data. The applications then interpret and enable data querying.

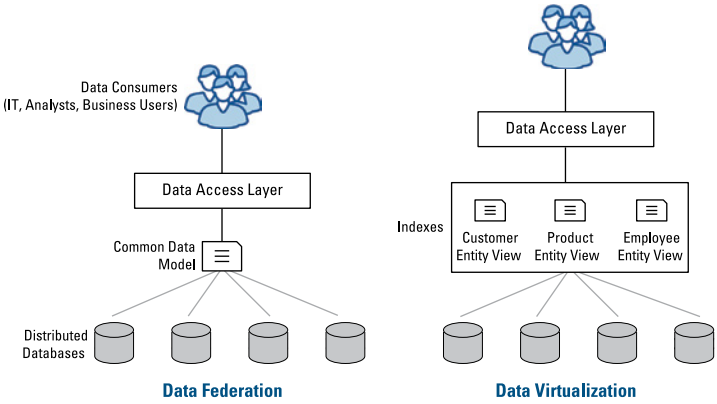

FIGURE 5-1: Data federation (left) creates a common data access layer across disparate, distributed data sets. Data virtualization (right) adds an indexed abstraction layer.

WARNING

The disadvantage to federation is its potential for latency delays when it comes to querying versus just accessing and viewing the disparate data. Think of federation like your browser when you access the Internet. Once you point your browser to a certain webpage, particularly a web portal such as Yahoo, you're viewing data held in thousands upon thousands of remote servers. If you were to perform a search (in other words, run a query) for some particular information, the response time for that query to return a value would likely be slower than it would be if all that data were stored in a local data repository at your site. However, clearly, this is an acceptable tradeoff given the impracticality and cost of hosting all that information yourself.

Data virtualization

The next step up from data federation is *data virtualization*. Virtualized data is in effect a virtual database. Similar to federated data, virtualized data serves as a data access layer for applications (refer to Figure 5-1). Data virtualization differs from federation in that it requires similarly formatted data or strict data models. The data virtualization tool then creates indexes to the data in order to speed up queries.

The drawback to data virtualization is that if the disparate data sources aren't similarly formatted, then significant effort will be required to model the data in order for the virtual database to operate at acceptable speeds.

Data lakes

Unlike the federation and virtualization approaches, which leave data at their source locations, a *data lake* is a storage repository that becomes a destination for disparate sources of data, as shown in Figure 5-2. Data movement is usually involved. Data lakes can be small or extremely large (up to multiple petabytes in size). They can contain a wide variety of data formats, such as text files, CSVs, tables, PDFs, and images.

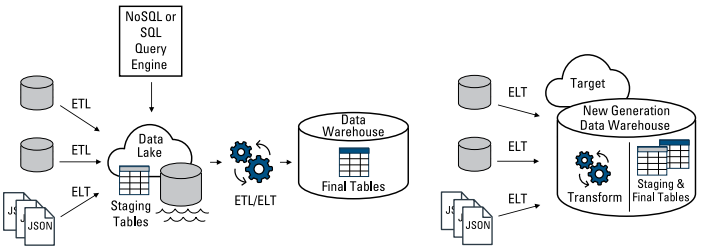

FIGURE 5-2: Data sources centralizing into a data lake (left) and into a new generation data warehouse (right), featuring ELT data loading.

Data lakes can be deployed on-premises or in the cloud. The deployment choice largely depends on cost factors and the level of agility required. It is hard to beat the economics of cloud-based data storage with pricing as low as $17 to $23 per terabyte (compressed) per month and no hardware to own and keep up to date.

The primary advantage of a data lake architecture approach is that it is a flexible option to serve as the central repository of data. With access privileges, all communities of professionals within a company that must work with and analyze the data (this includes business analysts, data scientists, data engineers, and IT architects) can use their query method of choice. However, this comes at a price. Proceed with caution.

WARNING

The challenge with data lakes is that, even with access privileges, it takes special skill to manage all the different types of data files that land in a data lake and to create queryable datasets or a structured database from the data. Data professionals, including data scientists, prefer to work with databases rather than raw files. Most likely, creation of a dataset will have to be directed to a technical person within IT with the skill to do such a thing. This creates time delays in experiencing value from the data and it creates burdens on (and bottlenecks through) IT. In addition, without proper governance and cataloging, data lakes can become a dumping ground for data — the proverbial data swamp. Over the years, without proper tooling, the data lake approach has garnered a notorious reputation for being complex to implement and manage.

New-generation cloud data warehouses

New-generation cloud data warehouses represent a true advancement of data warehouse technology. In addition to supporting the common CSV and other formats, these technologies can accept and load JSON files in their native format. From here a new generation data warehouse may automatically parse the JSON data to flatten its structure and present a column-oriented table version of the JSON data, ready to be queried in a relational manner with standard SQL, solving a critical challenge with data lakes.

With the new-generation data warehousing technology performing all the heavy lifting to transform non-relational data files into a relational structure, business analysts, data scientists, and data engineers can extract value from that data much faster. A column-formatted table for the JSON data will also produce faster analytics results.

New-generation cloud data warehouses also typically separate compute resources from storage resources. Doing so enables these two resource groups to independently scale, lowering the per-terabyte cost of storage compared to traditional data warehouses that lock data and compute resources as they scale.

WARNING

Because the storage layer is separate from the compute layer, new generations of cloud data warehouses can essentially offer an integrated data lake and data warehouse all-in-one package. This design removes some of the complexity of typical data lake approaches, but it too has disadvantages. The larger the company and the more data professionals there are, the more likely individual groups may not all prefer the same data warehouse tool. Also, leading new generation data warehouse vendors tend to employ consumption based pricing, meaning the meter is always running with usage of their data warehouse. If everyone is piled into a new generation data warehouse with consumption pricing, care must be taken to monitor resources and ensure meters are turned off when not in use. Consequently, companies are discovering that the most flexible arrangement is to have a cloud-based data lake and a new-generation cloud data warehouse co-existing side-by-side. This approach enables the data lake to be the primary holding bin for all data while serving all communities, while maximizing flexibility.

ENABLING OVER 500 USERS TO BUILD THEIR OWN PIPELINES TO AND FROM A DATA LAKE

EXAMPLE

Pitney Bowes (PB) is an American technology company offering customer engagement, e-commerce, mail, and shipment services to more than 100 countries worldwide. PB continuously innovates to keep pace with the evolving complexities in commerce — from launching its Model M Postage Meter in the 1920s to introducing cross-border solutions more recently. To continue setting new records in commerce, PB relies on data to make business decisions with precision. PB embarked on its digital transformation journey with the goal of giving data access to stakeholders to uncover new opportunities and areas for improvement to drive business growth.

No-code integration: PB observed that IT was spending more time hand coding ETL pipelines to gather data instead of focusing on delivering value from its data lake project and enabling users to get access to the data they needed. PB sought and installed a modern, intelligent iPaaS integration platform and virtually eliminated hand-coded integrations. PB now connects more than 25 applications, completes more than 1,000 integration projects within its data lake implementation, and processes over 900 billion documents a year.

Automating data analytics: Over 500 users from sales, marketing, finance, e-commerce and business operations can now share and analyze data within PB. For example, marketing analyzes trends to understand customer behavior based on campaigns and offers, and now creates targeted offers based on customer spend and usage. The e-commerce team analyzes shipping and mailing data to uncover performance bottlenecks, delivery prediction, return volume analysis and more.

Metrics Achieved:

- 25+ business applications connected to its data lake and cloud data warehouse
- 500+ users from 20 departments and business units construct their own data pipelines
- Users, via self-service, pushed 1 TB+ into its Snowflake cloud data warehouse, monthly
- 900B+ documents processed per year
- Rapidly gained business insights from disparate data sources

Key Endpoints: Amazon Web Services, Kafka, Microsoft SQL Server, MongoDB, MySQL, Salesforce, SAP, Snowflake, Vertica

Taming Integration with Modern, Intelligent iPaaS and Automation

With all the different options for application integration and data integration, data platforms, and data warehouse infrastructure types, the potential is high for an undesirable sprawl in integration tools. Combine this with the exploding growth of applications to be supported as companies embark on digital transformation and move to the cloud, and it all can be overwhelming to manage if you're the IT platform architect. It certainly will be too technical and complex for the typical business user to engage with. Furthermore, to achieve genuine enterprise automation, across the enterprise (on-premises or in the cloud), technical specialists and developers must write a bunch of code that performs integration tasks between applications. This also involves time and complexity.

DID YOU KNOW?

By 2024, in part to fill the developer shortfall, 30 percent of staff in organizations with 1,000 people or more will have some development or automation duty, making them the fastest-growing employee type (IDC FutureScape: Worldwide Future of Digital Innovation 2021 Predictions; `https://www.idc.com/getdoc.jsp?containerId=US46417320`).

This is where a modern, intelligent iPaaS solution that offers a low-code and no-code, graphical user interface approach to accomplish integrations comes in. From a people perspective, the modern, intelligent iPaaS drives the trend toward more intelligent, more intuitive, and more inclusive enterprise-grade services that are fast and fluid — empowering all workers.

From a platform perspective, modern best-of-breed iPaaS solutions offer multi-function integration capabilities, such as application integration, data integration, automation, API development and management and more all within the platform and one code stream. The benefit is you can eliminate one-off tools and consolidate. In addition, with the hand-coding approach, a developer is limited to performing application integration only. Other tools would be required to perform data integration. Enterprise-wide automation would be even more complex and difficult to achieve with manual coding.

REMEMBER

The ultimate goal should be to implement a modern integration approach that takes advantage of cloud scale and agility, and that includes native artificial intelligence capabilities. That means the ideal solution will not contain legacy components that prevent the solution from running at cloud speed. A modern integration approach also means having a single platform that enables you to integrate applications and data in a single solution that is easy to use, easy to manage, and easy to provide a holistic view of all integrations (end-to-end). It needs to be easy to engage and use for business users.

A modern, intelligent iPaaS enables you to accomplish these goals, whether your preferred integration method is to deploy an intelligent graphical interface to build pipelines or to script and manage your own APIs to exchange data.

A modern, intelligent iPaaS is also a purpose-built event-driven, streaming platform capable of automating streams of operational data between applications. It can automate data flows into a variety of data fabrics, data warehouses, and data lakes. A modern, intelligent iPaaS brings to life your visions of connecting your enterprise and automating business processes. You can create custom applications and journeys of all types, such as Customer-360, Procure-to-Pay, Employee Hire-to-Retire, Quote-to-Cash, and more.

MODERNIZING TO DELIVER EXCEPTIONAL CUSTOMER EXPERIENCES

EXAMPLE

T. Rowe Price Group is a publicly traded, global asset management firm. It offers IRAs, rollover IRAs, 529s, equity, and fixed income mutual funds. Its offerings also includes digital investing programs, retirement planning, fund comparisons, and other investment tools.

Moving to the cloud: T. Rowe Price sought to retire legacy applications to remove data silos across its organization. By breaking down data silos, the company can then uncover untapped opportunities and accelerate its growth. The company, however, operated with disparate on-premises and cloud applications stitched with multiple integration tools covering more than 16,000 integration mappings, making it very difficult to gain data insights.

To achieve its move to the cloud, T. Rowe Price consolidated and migrated all four legacy integration tools to a unified, hybrid intelligent, integration platform. The company can now seamlessly integrate legacy systems with cloud applications while adopting new technologies.

Accelerating marketing efforts: A big driver behind its move to the cloud initiative is to boost its marketing efforts. Having a holistic view of its customers, or a customer-360 view, through connecting customer data from different applications enables the marketing team to personalize customer engagements and promotions along the multichannel customer journey. Customers enjoy higher levels of personalized customer experiences, while T. Rowe Price can optimize revenue

(continued)

(continued)

opportunities by cross-selling products and services offered in its portfolio.

Metrics Achieved:

- Achieve a 360-view of the customer via 17 connected applications
- Over 150 users empowered to build integrations spanning across 4 business units
- Increased cost savings by consolidating 4 integration tools into a unified, hybrid integration platform

Key Endpoints: Custom data journeys via REST APIs, Salesforce, Snowflake, Splunk

IN THIS CHAPTER

- Delivering business processes automation across the enterprise
- Simplifying complex business journeys
- Enabling enterprise automation with a modern cloud integration platform
- Adjusting business plans in the age of COVID and the new normal that follows

Chapter 6
Understanding the Value of an Integration Fabric

With all the challenges outlined throughout this guide, it's simple to understand the need for a platform service that makes integration easier:

- Perform application integration? Check.
- Consume APIs, graphically without scripting? Check.
- Create and manage your own Open APIs? Check.
- Consolidate data flows, on-premises or in the cloud? Check.
- Automate business processes? Check.
- Embrace business users with an easy interface? Check.
- Manage and orchestrate centrally? Check.
- Harness cloud scalability? Check.

Defining the need is easy. The hard part is engineering and producing the platform that actually delivers all the above in an all-in-one environment that operates at cloud speed and scale, and that is also easy to use. A modern, cloud iPaaS solution meets the challenge.

This chapter opens the hood and dives in deeper.

Dissecting a Modern, Intelligent Integration Platform as a Service

At the top level, to connect the enterprise and automate business processes, a modern, intelligent integration platform as a service (iPaaS) first and foremost delivers fast, multi-point integrations with the ability to address both real-time, operational application integration and batch-oriented data consolidation requirements, as shown in Figure 6-1. What does this mean?

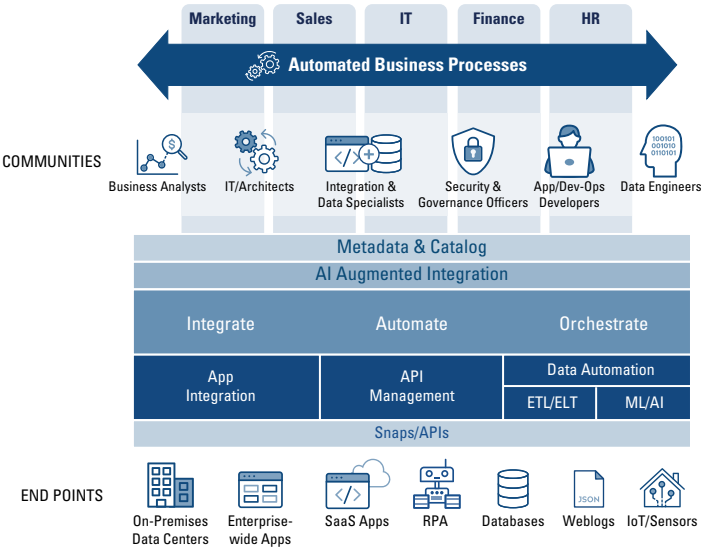

FIGURE 6-1: A modern, intelligent integration platform-as-a-service (iPaaS): application integration, data automation, API development, and management.

Fast integrations

The modern, intelligent iPaaS balances design simplicity with a powerful platform so that you can get up and running quickly, connecting applications, getting data where it needs to go ASAP — including consolidating application data in data lakes or data warehouses for analytics. This results in faster time-to-value for the integrations, yielding benefits such as responding more quickly to application events, analyzing data and developing insights faster, and collaborating sooner. These benefits combine to accelerate business results.

Multi-point integrations

The modern, intelligent iPaaS provides a wide variety of pre-built connectors — hundreds, out of the box. You can connect operational data that flows to and from multiple SaaS applications, with little or no coding. You can also flow data from multiple sources to a single target for analytics against the consolidated data. You choose the destination, enabling you to avoid having your data locked into any one particular on-premises or cloud data warehouse, for instance. If a particular connector is not pre-built, the modern, intelligent iPaaS allows you to connect using standards-based connectors providing SOAP and REST API, SFTP and more connectivity, with the various authentication methods, such as OAuth2, certificates and others, and even enables you to build your own custom connector via a Java-based software developer kit.

Protecting investments with cloud flexibility and scale

Enterprise automation via the modern, intelligent iPaaS is built for the cloud and is flexible, and as previously mentioned, it reaches down to on-premises environments. Companies needing on-premises connectivity with traditional enterprise data center applications, databases, and data stores (such as SAP, Oracle, Microsoft Dynamics AX, Hadoop, and others) have the ability to install the modern integration platform's elastically scalable data plane on the company's own data center servers. After the initial setup, the on-premises data plane's lifecycle (such as health monitoring and software upgrades) is remotely managed by a cloud-based control plane.

The modern, intelligent iPaaS is designed and engineered to come to your data. No need to migrate data or breach your security. Extend the life of your on-premises environment and protect your investment.

Ensuring Security

Communications between the control plane and the on-premises data plane, over HTTPS, is via an encrypted link (using port 443, the standard secure port used for secured HTTP traffic, just like

any other secure link used for secure web applications like salesforce.com or other enterprise applications). This port is opened outbound from the on-premises data plane to the cloud-based control plane.

Enabling Ease of Use — Empowering People

Building integrations (also called *pipelines*) is a simple, visual drag and drop, and configure exercise that is done in a browser, as shown in Figure 6-2. With no or little coding required, the cloud-based workflow designer makes building multi-point integrations easy for both technical and non-technical integrators, IT, and business groups. Additionally, providing a guided experience, a modern, intelligent iPaaS employs artificial intelligence to recommend the next step in the pipeline building process. Complete design and deployment of the data pipeline is executed from the browser experience, including validation and testing of the pipeline. Taking things a step further, a modern, intelligent iPaaS offers different user interface options support that enable IT groups to roll out a streamlined interface for the internal business user groups they support. Moreover, empowered business teams may pursue this option on their own.

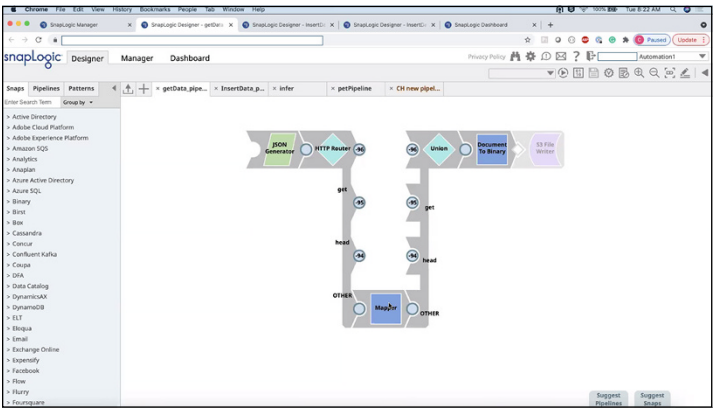

FIGURE 6-2: A visual drag and snap (drop) user interface, featuring artificial intelligence (AI) assisted next-step recommendations, dramatically simplifies and accelerates data pipeline building.

Monitoring and Orchestration

The modern, intelligent iPaaS's dashboard allows you to track performance of your integration workloads. The monitoring dashboard provides secure visibility into the health of your integrations with system performance dashboards, drill-down capabilities, and triggered event notifications. Administrators can manage their infrastructure from any device. This means you have complete remote visibility into your real-time and scheduled integrations.

Connecting and Automating the Enterprise

With the large number of connectors available, the modern, intelligent iPaaS can read or write data from all types of data sources (CSV, JSON and XML files, Oracle and MS SQL Server databases, S3 and so on), application sources (Salesforce, SAP, Workday, ServiceNow, Oracle ERP, NetSuite), and protocols (HTTP, REST, SOAP, FTP).

Through the task modules that are snapped together like LEGO blocks — see Figure 6-3 — users can also preview read/write endpoint data, services, and objects. Users can also transform, enrich, or cleanse data.

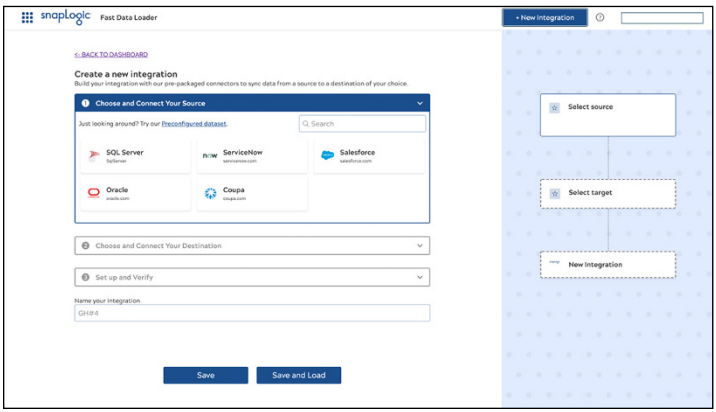

FIGURE 6-3: Additional user interface options such as a no-code menu with prebuilt pipelines, from popular data sources to popular cloud data warehouses, provide even wider appeal for business users.

Unlike point-to-point integration tools, the modern, intelligent iPaaS allows easy orchestration across multiple endpoints via a single pipeline or multiple pipeline journeys. Parent pipelines can have *child* pipelines. In all, these journeys can be triggered based on specific events or scheduled time. As well, journeys can be executed as jobs when the journeys are called via REST APIs or invoked programmatically, including automated error handling, each of which with its own event triggers.

As a result, journeys of all shapes, sizes, and functionality can be pressed into action to automate business processes such as Customer, Procure-to-Pay, Employee Hire-to-Retire, Quote-to-Cash, and more (first mentioned in the previous chapter).

Automating the Hire-to-Retire journey

When you think of enterprise automation, it's all about integrating and flowing operational data and/or analytics data between applications and data stores, respectively, to automate business processes. The goal is to eliminate complexity, simplify the business process, and accelerate positive business outcomes. Technical IT managers, business users, and business process managers can create and launch these journeys with relative ease.

Take a look at a commonplace Hire-to-Retire employee journey, as shown in Figure 6-4. A company environment may include an applicant tracking solution such as Jobvite. The Human Capital Management (HCM) solution is Workday. Your IT service management solution is ServiceNow. You may have an employee performance management solution such as Kudos and then ADP for payroll services.

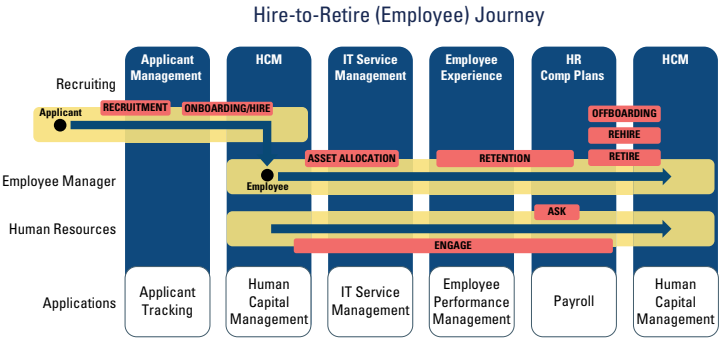

FIGURE 6-4: End-to-end employee journey automated with a modern intelligent, integration platform.

The hiring manager posts a job requisition to Workday. The recruiting manager then posts the requisition as a job opening on the company's website via Jobvite. A prospective candidate is interested and applies for the job. From this event, a sequence of data pipelines kicks off. If the applicant looks good and is accepted, he or she is scheduled for an interview and the applicant tracking app sends a calendar message to the interview team. If the person is hired, this triggers another series of data pipelines, including establishing a payroll account via ADP. Data continues to flow as the employee is established, managed, and given raises. All the way until the employee leaves the company, at which time the workflow deprovisions all the employee's application access and moves the employee's data to an archival system.

Automating the Customer journey

A Customer journey executes in a similar manner. Based on event triggers built into the journey, data flows from one application to another: Marketo to Salesforce to Adobe Customer Experience cloud, to Medallia for product usage data, and then to a cloud data warehouse for analytics on the usage data. Journeys are constructed to automate and drive business processes, which reduces manual, error prone efforts, avoids data duplication, and overall, makes the business operate more efficiently. Organizations experience simpler processes and better business outcomes.

The value of automation in the age of COVID

The global health crisis continues to rage on and is projected to persist through to the end of 2021 and linger possibly through 2022. As a result, it's a business imperative to implement processes and procedures that physically protect workers and that provides self-sufficiency for remote workers. The less physical contact that can be practiced among employees during these difficult times, the better. Automated business processes may play a contributing role by reducing physical contact.

Better execution of application and data integration is a step in the right direction to boost business outcomes from digital transformation strategies. As highlighted in Chapter 3, Twilio's study shows that 96 percent of those surveyed indicated the COVID health crisis accelerated digital transformation strategies by as much six years in some cases. Companies are discovering enterprise automation is a weapon that allows them to accelerate digital transformation efforts.

EMPOWERING OVER 1,000 USERS TO BUILD THEIR OWN INTEGRATIONS

EXAMPLE

Adobe is a Fortune 500 company and a leading software company known for its software used for the creation and publication of content, including graphics, photography, illustration, animation, multimedia, motion picture, and print. Adobe has expanded its business to include marketing and commerce cloud solutions, organically and through acquisitions, such as Magento, Marketo, and Workfront.

Effective business model: Adobe went through a digital transformation in the early 2010s, transitioning its business into a subscription-based SaaS model. To transition to the new subscription model, it recognized a need to transform business systems and operations. It would have to change from managing large batches of data with predictable schedules to processing and streaming data in real-time. By modernizing its integrations, Adobe improves the overall customer experience while enjoying optimized revenues from their subscription-based model.

Thousands of self-service users: Adobe's center of excellence (COE), composed of over 50 full time employees, built and managed integrations. This approach, however, proved to be unscalable as the business requested more integrations over time. By adopting a low/no-code integration platform, the COE is able to decentralize integrations. Now thousands of employees spanning from operations to development to marketing teams are empowered to build their own integrations and applications, without relying on IT, speeding up the time to deliver projects.

Metrics Achieved:

- Grew market capitalization over 380 percent in 3 years
- Saved $105M in costs with a modern, intelligent iPaaS ($50M in direct savings, $55M indirectly)
- Over 1,000 users empowered with self-service
- Achieved 80 percent acceleration in business process implementations
- Delivered 81 percent improvement in SLA time to process subscriptions (from 11K subs/min versus 2K subs/min)

Key Endpoints: Amazon Redshift, Anaplan, Custom applications via REST and SOAP APIs, Kafka, Hadoop, MySQL, Oracle, SAP, Salesforce, Snowflake, Tableau

IN THIS CHAPTER

- Steps for automating your enterprise
- Practical tips for success

Chapter 7

Ten Steps to Advancing Enterprise Automation

"Where there is no vision, the people perish." Proverbs

As your integration journey progresses, it's important to have a goal in mind and a plan in place to achieve that goal. You'll want to start by getting a grip on the application and data integration challenges that exist in front of you and how digital transformation and enterprise automation can help with them as you grow into the future.

Follow the ten steps outlined in this chapter, and your company will be on track to become a modern, enterprise automation success story.

1. Summarize Current Challenges and Process Pains

Identify your headaches. You almost certainly have some. For example, perhaps your business processes execute slowly, or you aren't able to adapt swiftly to changing business conditions. Don't try to list every single challenge across the enterprise; focus on the big picture, and consider the challenges related to data flows that hamper critical business processes.

2. Identify Stakeholders

List the community of executives, decision makers, and influencers who have a say in the vendor selection process, or who benefit from connecting the enterprise and automating business processes. Check in with individual users too.

3. Summarize Desired Outcomes

Next, outline the future state objectives — in other words, define how you want things to work when the transformation is complete. A modern integration platform is supercharged with automation capabilities that empower you and users to reduce friction in your process flows. Ask the teams you support to validate the outcomes desired.

4. Anticipate Future Changes

Expecting a solution to last forever is not realistic. But, your solution needs to be able to evolve gracefully and accept updates and changes as you capitalize on future opportunities and react to future market and industry changes. Deliberately expecting change and baking evolution into your plans makes it more likely that your future state solution will have staying power.

5. Establish Success Metrics

Identify the criteria for success and the necessary metrics for measuring it. Common metrics related to application and data integration and enterprise automation projects include a set timeline for implementation to avoid new service charges, the number of users empowered to build their own integrations, or a specified reduction in time-to-value from data integrations.

6. Identify Applications, Data Sources, and Other Systems of Record

Inventory the applications and other source endpoints in your environment that are part of this plan. Group or categorize the applications according to how they relate to one another (Human Capital Management, Finance, Marketing, Sales, and so on). Define the needed data journeys. Resist the temptation to jump ahead to this step without laying the groundwork.

7. Identify Necessary Data Repositories, Analytics Platforms, and Other Destination Endpoints

As part of the data fabric, if the modern integration platform must flow data to an analytics platform, it's important to ask whether the data will flow directly to a data lake first or directly to a data warehouse. In this line of thinking (given that some new generation data warehouses claim to be a data lake too), the data lake is a separate repository that sits outside of the data warehouse. There are pros and cons for having a data lake separate from the data warehouse.

The pros include greater flexibility for user access. Not all groups that must work with the data will want to work with the same data warehouse tools. The cons against a separate data lake include added complexity (for example, multiple data platform components and integration tools) and potentially data duplication and cost. The good news is a modern integration platform can minimize the complexity issue by providing a single platform for multiple integration options, eliminating the need for multiple, point-solution, integration tools for the different data platform destinations.

8. Evaluate Solutions

Now you're ready to start evaluating solutions. For example, when you have a data warehouse or data lake, along with application integration requirements, it's all the more important to evaluate a multi-function iPaaS platform capable of modern enterprise automation. A multi-function iPaaS enables application and data integration, API development and management, and more, all in a single platform, single middleware tool experience that dramatically simplifies data architectures.

REMEMBER

As you compare, make sure the different options you consider meet the following criteria:

- Delivers ease-of-use that empowers high numbers of technical and non-technical users — democratizing integration
- Accelerates your business with the shortest time-to-value from integrations as possible supported by a track record of proven ROI and TCO advantages
- Offers a broad selection of prebuilt connectors
- Secures and encrypts data in motion, with customer managed keys

- Supports data flows for low latency operational needs, as well as analytics needs
- Enables application integration and data integration, with no-code and low-code options
- Extends end-to-end, on-premises, across multiple clouds and across multiple SaaS solutions
- Enables you to control where the data processing takes place to ensure compliance with regulatory requirements

Figure 7-1 shows an app and data architecture with a modern, intelligent iPaaS.

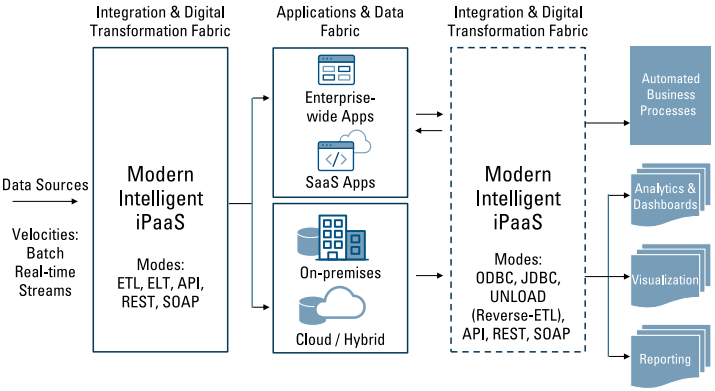

FIGURE 7-1: High-level diagram of a modern, intelligent iPaaS as middleware; a single platform that consolidates integrations, driving digital transformation and automation across an enterprise.

9. Pursue a Demonstration

Create a short list of contenders and seek a demo to test how well a solution meets your needs, current and future. Take advantage of free trials! Some vendors offer very low friction solutions to get started, with offers such as prebuilt pipelines and a million records loaded a month for free to popular cloud data warehouses. Pursue a proof of concept (PoC) only if time allows.

10. Execute

With this step, it's go time! You've evaluated a short list. Now make the decision and put your plan into action. With this step, think about and define your post-execution metrics, including a plan to visualize the data via dashboards for the stakeholders identified in Step 2.

BUILDING AN AUTONOMOUS WORKFORCE

EXAMPLE

Schneider Electric is a Europe-based, global leader in energy management and automation with operations in more than 100 countries. Through digital transformation in the energy sector, it's committed to achieve climate-positive impact while empowering everyone to make the most of energy and resources.

Building an autonomous workforce: Digital technologies are becoming easier to use and widely available. Employees are likely to adopt them and become more autonomous. As part of its digital transformation journey, Schneider Electric's center of excellence (COE), managed by the integration team, changed its operational model. The integration team launched a citizen developer DIY (do it yourself) model to decentralize its integration support and allow employees to build their own integrations and applications. The model consists of four levels of integration support, including centralized, close, light, and autonomous support. Employees interested in becoming more autonomous would be onboarded to the integration platform and certified to build their own integrations.

Breaking customer data silos: Large volumes of customer data reside in many data silos, including over 100 ERP systems, across the company's business units. Schneider Electric consolidated these ERP systems and connected the data into Microsoft Azure to achieve a single source of truth and improve personalization for customer engagements.

Metrics Achieved:

- Lowered support costs by launching the Citizen Developer DIY model
- Reduced the time-to-market by increasing employee autonomy
- Eliminated subscription costs for 100s of ERP instances by consolidating the ERPs and moving the data into Microsoft Azure

Key Endpoints: Anaplan, Box, Concur, JDBC, Microsoft Azure Data Lake and Synapse Data Warehouse, NetSuite, Salesforce, SOAP API, Zuora

Integrate and transform your organization with modern enterprise automation

Pursuing digital transformation, organizations moving to the cloud are now awash with applications and data everywhere. The challenge is most applications and data don't talk. This leads to slow business processes, delayed insights from analytics, and stalled business growth. Enterprise Automation For Dummies explores what modern enterprise automation is all about. Learn how IT and business teams can eliminate application and data integration barriers, empower people to work differently in the post-pandemic age, and accelerate business results.

Inside...

- How the post-pandemic age forces change
- Why digital transformation fails
- The evolution of integration technology
- How to quickly achieve automation across the enterprise, on-premises, and clouds
- Practical tips for app and data integration
- Real-world case studies with metrics

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Michael Nixon is vice president of product marketing with SnapLogic and an enlightened professional in the cloud data solutions industry. He has authored or contributed to three *For Dummies* books.

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